

ON MARINE MOLLUSCA FROM THE KERMADEC ISLANDS, AND
ON THE 'SINUSIGERA APEX'.

By TOM IREDALE.

Read 14th January, 1910.

DURING the major portion of the year 1908 I was on Sunday Island, the only habitable island of the Kermadec Group. I was endeavouring to make a representative collection of the molluscan fauna. Unfortunately the nature of the seas around the island counteracted my efforts to such an extent that I can only claim to give a glimpse of this very interesting fauna. I say very interesting, as, though the geographical position of the island promised that the forms would repay study, I did not even anticipate such results as I have obtained, sanguine as I was. From the nature of the flora of Sunday Island, and because it was politically a part of the Dominion, the group has been zoologically attached to New Zealand.

The land molluscs on record showed, however, little affinity, whilst the very few marine forms previously obtained were almost all additions to the New Zealand list.

I propose to give some idea of the island, collecting-grounds, and reasons for the poverty of the collection made. Sunday Island is, roughly speaking, 600 miles north-east of New Zealand, the same distance east of Norfolk Island, and south of Tonga, which are the nearest land points. It is a volcanic crater apparently rising out of a great depth. It is irregularly triangular in shape, a deep bay making the west coast, the north coast being mostly sand and boulders, whilst the east and south, forming the third side of the triangle, were boulder beaches. Towards the north end of the east coast was a shallow bay, which was the only littoral workable portion of the coastline. The prevailing winds were east and west, the former from October to April, the latter the remainder of the year. Both these made the north coast unworkable, but all the molluscan life had years before been driven into deeper water, so that not much regret was felt about this. The west bay was gravel, the two ends being boulders. The terrific force of the westerlies prevented molluscs from existing within their reach, so that nothing practically lived within 5 fathoms save among the boulders, where they were not obtainable by any ordinary means.

The south coast was as barren as the north, whilst the southern end of the east coast was similar. This left the northern end of the east coast as the only place where shore-collecting could be carried out. This was also a boulder formation, but, protected to a certain extent by the islets, a few molluscs could be obtained by hard work. This consisted of wading and lifting the stones by means of crowbars. Under stones easily lifted nothing was the general result.

That littoral collecting would be poor had been anticipated, but

good results were hoped for from a study of the chart by means of dredging.

The south and south-east coasts sheer down immediately, off the south-east corner over 200 fathoms being plumbed within a quarter of a mile of land, whilst a few miles off over 5000 fathoms are obtained. The south coast varies from 50 to 150 fathoms quite close in. The whole of the west bay, however, is under 30 fathoms, steepening immediately outside the points. The north coast runs out under 30 fathoms for about 2 miles, and then sheers down. The east coast inside the islets is about the same depth, dropping immediately adjacent to the islets to great depths. For the purpose of studying this shallow water an oil launch was taken. Upon arrival at the island, however, it was found that there was no landing-place on the north or east coasts, the only course being to pull the launch up on the west coast. The slightest wester, rushing right into the bay, prohibited its launching. Consequently it was scarcely used. This was the more aggravating as the very few hauls gave promise of a peculiarly rich fauna. When out in the launch, by means of the sea-telescope the bottom could be examined to a depth of over 10 fathoms.

Close to the rocky shore the boulders continued to about that depth. Magnificent algæ monopolized these boulders for about 3 fathoms, then succeeded coral of many hues and weird shapes. Attempts to drag pieces up resulted in loss of dredges, such few pieces as were obtained urging to further efforts. By carefully hunting the beach a few specimens were collected, but usually the force of the waves left only fragments to denote the nature of the animal. One of the islands off the north-east corner had a nice littoral collecting-ground, but this we were prevented from studying on account of the westerlies. I got one or two good molluscs there, not otherwise obtained.

On the wave-swept boulders lived four or five Limpets, four Chitons, a couple of *Siphonaria*, *Nerita melanotragus*, Smith, *Thais Smithi*, Braz., and *Planaxis Brasilianus*, Lam.

The sub-littoral fauna was characteristic. By sub-littoral I mean forms which lived so near low-water mark they could be procured by wading, and at the bottom of rock-pools. The commoner sub-littoral forms were mostly novel, the rarer forms being stragglers from deeper water, and usually belonging to species of widespread distribution. To the former belonged five more Chitons, an *Emarginula*, a *Fissurellidea*, a big *Trochus* near *pyramis*, Born, a *Clanculus*, a *Gena*, a *Trivia*, a *Pisania*, a *Cantharus*, and a fine *Conus*. The latter included *Angaria tyria*, Reeve, *Thais chaidea*, Duclos, *T. succincta*, Lam., *Argobuccinum australasia*, Perry, *Septa rubicunda*, Perry, *Epitonium perplexum*, Pease, *Columbella versicolor*, Sowb., *Conus minimus*, Linn., *Umbraculum umbella*, Martyn, *Arca Domingensis*, Lam., *Codakia bella*, Conrad, *Lasæa miliaris*, Phil., and *Modiolus auriculatus*, Kr. Here also were found quite commonly Aplysioids of various genera which have not yet been studied. A few Pleurobranchs, and very rarely an odd Nudibranch, turned up, with a few *Umbraculum umbella*, Mart. None of these shells was abundant, all required much searching for,

and I conclude these had probably only very recently established themselves from the following facts. Most of this category were found living adjacent to the north-east corner. This appeared to be the landing-place of these visitors. Small colonies of *Tectarius Feejeensis*, Rve., *Melina nucleus*, L., and *Gadinia conica*, Angas, there alone lived, whilst in the pools the fry of *Meleagrina vulgaris*, Schum., kept casually appearing. An odd specimen of *Nerita plicata*, L., was once found, and one day a stray *Litorina Mauritanica*, Q. & G., settled there.

The shells most frequently met with dead on the beach belonged to this same class. Such were *Cerithiopsis sinon*, Bayle, *Polinices simia*, Desh., *Cymatium Spengleri*, Gmel., *C. exaratum*, Rve., *C. labiosum*, Wood, *Cassidea cernica*, Sowb., *Alectrion spiratus*, A. Ad., *A. gaudiosus*, Hinds, *Lyria nucleus*, Lam., *Terebra venosa*, Hinds, *Bullaria ampulla*, Linn., *Placunanomia ione*, Gray. From pieces of coral pulled out of 6 to 9 feet, at dead low water, were obtained *Coralliophila monodonta*, Q. & G., and *Magilus antiquus*, Montf.

As Hedley notes that the pelagic fauna was scarcely represented at Funafuti, and I observe Melvill & Standen record none from Lifu, it is interesting to note that pelagic forms were not uncommonly met with on the beaches. Four species of *Ianthina* and one of *Recluzia*, as well as many Pteropods, were picked up, the former being alive. On some days the cast-up *Ianthina* and *Verella* made a blue line on the sand. With these shell-bearing pelagic forms also occurred the Nudibranch *Glaucus*, and one or two Eolids came up on driftwood and pumice. Shells of *Spirula spirula*, L., were not uncommon, and, in the spring, a few *Argonauta argo*, L., and *A. nodosa*, Sol., came to land. From logs cast up on the beach species of *Nausitoria* and *Xylophaga* were extracted, as well as one specimen of *Saxicava arctica*, L.

Both Hedley from Funafuti, and Melvill & Standen from Lifu, record an overwhelming majority of Gastropods over Pelecyopods. The same occurred here. No bivalves really lived in the littoral or sublittoral zones, the forms collected there being stragglers. Furthermore, very few were dredged, and these were all small things. However, a valve of *Lutraria oblonga*, Gmel., an undetermined *Maetra*, a fragment of a big *Pecten*, valves commonly of a fine *Spondylus* and *Chama* point to some good finds yet to be made in this direction.

Owing to the importance of this collection to students of Zoogeography, it is very necessary that the species be accurately determined. Inasmuch as the majority of the shells obtained are minute and of Indo-Polynesian affinities, it will be some time before even the small number I got will be correctly worked out. Furthermore, I have found great difficulty in generically locating such well-known species as *Drupa* (?) *chaidea*, Duclou, and *Galeropsis* (?) *monodonta*, Q. & G.

I am herewith giving a short list of species certainly identified, with a few notes on some interesting shells, and remarks on the 'Sinusigera apex'. I wish to acknowledge the invaluable aid that has been given me by Mr. Charles Hedley, of the Australian Museum, Sydney, and Mr. E. A. Smith, of the British Museum.

1. *Helcioniscus craticulatus*, Suter.
2. *H. dirus*, Rve.
3. *Ancistromesus Kermadecensis*, Pils.
4. *Angaria tyria*, Rve.
5. *A. distorta*, Linné.
6. *Leptothyra picta*, Pease.
7. *Nerita melanotragus*, Smith.
8. *N. plicata*, Linné.
9. *Littorina Mauritiania*, Q. & G.
10. *Tectarius Feejeensis*, Rve.
11. *Planaxis Brasilianus*, Lam.
12. *Rissoa carnosa*, Webster.
13. *R. candidissima*, Webster.
14. *Rissoina polytropa*, Hedley.
15. *R. plicata*, A. Adams.
16. *Cerithiopsis sinon*, Bayle.
17. *Strombus aratus*, Mart.
18. *S. urceus*, Linn.
19. *S. elegans*, Sowb.
20. *Xenophora corrugata*, Rve.
21. *Hipponix foliacea*, Q. & G.
22. *Natica sagittata*, Menke.
23. *N. orientalis*, Gmel.
24. *Polinices simia*, Desh.
25. *Ianthina ianthina*, Linné.
26. *I. umbilicata*, d'Orb.
27. *I. exigua*, Lam.
28. *I. globosa*, Swain.
29. *Recluzia Hargravesi*, Cox.
30. *Cypræa erosa*, Linné.
31. *C. caputserpentis*, Linné.
32. *Erato lachryma*, Gray.
33. *E. corrugata*, Hinds.
34. *Trivia Napolina*, Kiener.
35. *Septa rubicunda*, Perry.
36. *Argobuccinum australasia*, Perry.
37. *A. siphonatum*, Rve.
38. *A. papilla*, Wood.
39. *Cymatium Spengleri*, Gmel.
40. *C. Dunkeri*, Lischke.
41. *C. caudatum*, Gmel.
42. *C. exaratum*, Rve.
43. *C. costatum*, Born.
44. *C. labiosum*, Wood.
45. *C. vespaceum*, Lam.
46. *C. Parkinsonia*, Perry.
47. *Cassidea pyrum sophiæ*, Braz.
48. *C. cernica*, Sowb.
49. *Dolium pomum*, Linné.
50. *D. perdix*, Linné.
51. *Architectonica cingula*, Kien.
52. *Heliacus variegatus*, Gmel.
53. *H. stramineus*, Gmel.
54. *Epitonium perplexum*, Pease.
55. *Atlanta fusca*, Eydoux & Souleyet.
56. *Colus toreuma*, Mart.
57. *Mitra mitra*, Linné.
58. *M. carbonaria*, Swainson.
59. *M. lanceolata*, Hervier.
60. *Alectrion spiratus*, A. Ad.
61. *A. gaudiosus*, Hinds.
62. *A. scalaris*, A. Ad.
63. *Thais chaidea*, Duclos.
64. *T. succincta*, Lam.
65. *T. Smithi*, Braz.
66. *Columbella versicolor*, Sowb.
67. *Lyria nucleus*, Lam.
68. *Coralliophila neritoidea*, Lam.
69. *C. nivea*, A. Ad.
70. *C. Lischkeana*, Dunk.
71. *C. monodonta*, Q. & G.
72. *Magilus antiquus*, Montf.
73. *Marginella mustelina*, Angas.
74. *Turris cingulifera*, Lam.
75. *Terebra venosa*, Hinds.
76. *Conus vermiculatus*, Lam.
77. *C. minimus*, Linné.
78. *Pugnus parvus*, Hedley.
79. *Bullaria ampulla*, Linn.
80. *Bullina scabra*, Gmel.
81. *Limacina bulinoides*, d'Orb.
82. *Styliola subula*, Q. & G.
83. *Clio pyramidata*, Br.
84. *C. acicula*, Rang.
85. *C. virgula*, Rang.
86. *Cuvierina columnella*, Rang.
87. *Cavolinia tridentata*, Gmel.
88. *C. trispinosa*, Lesueur.
89. *C. longirostris*, Lesueur.
90. *C. inflexa*, Lesueur.
91. *Umbraculum umbella*, Mart.
92. *Siphonaria Diemenensis*, Q. & G. (?).
93. *S. atra*, Q. & G.
94. *Gadinia conica*, Angas.
95. *Placunanomia ione*, Gray.

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| 96. <i>Arca foliata</i> , Forsk. | 109. <i>Diplodonta Zelandica</i> , Gray. |
| 97. <i>A. Domingensis</i> , Lam. | 110. <i>Lasæa miliaris</i> , Phil. |
| 98. <i>Lima bullata</i> , Born. | 111. <i>Ervilia biscalpta</i> , Gld. |
| 99. <i>Philobrya costata</i> , Bern. | 112. <i>Chione toreuma</i> , Gld. |
| 100. <i>Modiolus auriculatus</i> , Krauss. | 113. <i>Lutraria oblonga</i> , Gmel. |
| 101. <i>Lithophaga straminea</i> , Dunk. | 114. <i>Saxicava arctica</i> , Linné. |
| 102. <i>Septifer bilocularis</i> , Linné. | 115. <i>Gastrochæna Retzii</i> , Desh. |
| 103. <i>Modiolaria impacta</i> , Herrm. | 116. <i>Chama foliacea</i> , Q. & G. |
| 104. <i>Meleagrina vulgaris</i> , Schum. | 117. <i>Nautilus pompilius</i> , L. |
| 105. <i>Melina nucleus</i> , Linné. | 118. <i>N. macromphalus</i> , Sowb. |
| 106. <i>Julia exquisita</i> , Gld. | 119. <i>Spirula spirula</i> , L. |
| 107. <i>Spondylus ostreoides</i> , Smith. | 120. <i>Argonauta argo</i> , L. |
| 108. <i>Codakia bella</i> , Conrad. | 121. <i>A. nodosa</i> , Sol. |

HELCIONISCUS CRATICULATUS, Suter.

Helcioniscus craticulatus, Suter, Proc. Malac. Soc., 1905, vol. vi, p. 352, figs. in text.

On the rocks at the Kermadecs, between tide-marks, five species of Limpets live. The big *Ancistromesus* is abundantly distinct, whilst two others appear to be local in their distribution. The remaining two are exceedingly plentiful, and fine typical specimens are very easily differentiated. These occupy rather different stations, one living nearer low tide than the other. About half-tide, however, they intermingle, and both species there are small. Shells so collected were studied by Suter, so that the description contains characters of both. I am, therefore, herewith drawing up an amended description of *craticulatus*, Suter, which name I restrict to the species dwelling higher up from low tide. The figures and type measurement agree with that species.

Shell oval, anteriorly scarcely narrowed, apex about the anterior third, anterior slope straight, posterior slope slightly convex. Margin scarcely crenulate. Finely ribbed, ribs between forty and fifty slightly more prominent than a remaining similar number. In young shells these ribs almost appear beaded, owing to the concentric lines of growth. Colour externally orange to brownish, with or without darker markings or streaks. Inside the spatula is brown, with a central white oval spot which generally increases with age. Specimens which are marked outside with dark radiating lines show these inside, otherwise below the spatula is pale orange, iridescent. Young shells are naturally more depressed than older ones.

Largest specimen, length 34, breadth 30, height 15 mm.

Medium " " 26 " 21 " 8 "

NERITA PLICATA, Linné.

Nerita plicata, Linné, Syst. Nat., 1758, 10th ed., p. 779.

In the Index Faunæ Novæ Zealandiæ appears *Nerita undata*, L., under which name a shell of the above species is in the Canterbury Museum. I can trace no record otherwise for New Zealand, save this Kermadec shell. One specimen only was collected alive on the rocks at the north-east corner of Sunday Island.

ARGOBUCCINUM SIPHONATUM, Reeve.

Ranella siphonata, Reeve, Proc. Zool. Soc., 1844, p. 138; Conch. Icon., pl. vii, fig. 38.

Under the name *Tutufa (Crossata) Californica*, Hinds, Suter has recorded this shell from the Kermadecs (Trans. N. Zeal. Inst., 1905 (1906), vol. xxxviii, p. 328). I have compared the shells I collected with the shell in the Auckland Museum upon which Suter based his record, and they are undoubtedly the same, and are as certainly Reeve's *siphonatum*.

ARGOBUCCINUM PAPILLA, Wood.

Murex papilla, Wood, Index Test. Supp., 1828, p. 14, pl. v, fig. 2.

Ranella verrucosa, Sowb., Conch. Illus., *Ranella*, 1836, p. 8, fig. 20; Kiener, Coq. Viv., 1841-2, p. 24, pl. xiv, fig. 1; Reeve, Conch. Icon., pl. v, fig. 24; Tryon, Man. Conch., ser. I, vol. iii, pp. 39, 279, pl. xxi, fig. 27.

A unique shell of unknown habitat in the British Museum was figured by Wood. Eight years later this same specimen was given a new name and refigured by Sowerby. Kiener, Reeve, and Tryon have reproduced Sowerby's figures and name, and ignored Wood's figure. Tryon reduced it to a synonym of *eruentata*, Sowb., but it is a very distinct and easily recognizable form. It was constantly occurring in a very much damaged state on the beach of Sunday Island, but no live specimens were obtained.

CYMATIUM LABIOSUM, Wood.

Murex labiosus, Wood, Index Test. Supp., 1828, p. 15, pl. v, fig. 18.

Triton Strangei, Ad. & Ang.: Smith, Proc. Zool. Soc., 1878, p. 816, pl. 1, fig. 16.

The latter name was reduced to a synonym by Tryon (Man. Conch., ser. I, vol. iii, p. 17), and in this case this course is justified. Specimens collected at Sunday Island were identified by Mr. Hedley as the shell known to him as *Strangei*, Ad. & Ang., and they are undoubtedly the same as *labiosus*, Wood.

CASSIDEA CERNICA, Sowerby.

Cassix cernica, Sowb., Proc. Zool. Soc., 1888, p. 211, pl. xi, fig. 19.

On the beach occurred rarely specimens of a small *Cassidea*, usually very imperfect. One was washed up alive, but in that case the shell was badly smashed. Examination of the literature showed nothing exactly like it, but in the British Museum specimens of the above species agreed perfectly, though the figure did not. It was described from Mauritius, which is an immense distance from Sunday Island. The species of the genus *Cassidea* seem very imperfectly known, as Melvill (Journ. Conch., 1905, vol. ii, pp. 176 seq.), writing of them as *Casmaria*, H. & A. Ad., only included two species with perhaps four sub-species. In that paper he overlooked this species, making no reference whatever to it.

EPITONIUM PERPLEXUM, Pease.

This species has already been recorded from the Kermadecs by Suter (Journ. Malac., 1899, vol. vii, p. 54), under the name of *Scalaria australis*, Lam.

IANTHINA UMBILICATA, d'Orb.

D'Orbigny described this species (Voy. Amér. Mérid., 1847, p. 414, No. 319), carefully comparing it with *exigua*, Lam., the preceding species, of which he wrote: "Cette espèce habite tout l'océan Atlantique dans les régions chaudes," and of this he stated: "Elle se trouve encore dans les mêmes circonstances." Yet Reeve (Conch. Icon., 1858, pl. v, figs. 22a-b, sp. 22) refers to it as a manuscript name of d'Orbigny's in the British Museum, attached to a shell of unknown habitat. Tryon includes it doubtfully as a synonym of *exigua*, Lam. (Man. Conch., vol. ix, p. 38, pl. x, figs. 21, 22).

It would appear to be a rare shell. I have seen specimens in the British Museum from the Sandwich Islands and North Pacific, as well as my Kermadec specimens. It has the form of *exigua*, Lam., but, being destitute of the rough sculpture of that shell, has a shiny appearance, and immediately attracts attention. The striæ are very fine, no more pronounced than in *globosa*, Swainson.

Tryon allows as varieties of *I. ianthina*, L., *planospirata*, Ad. & Rve., *trochoidea*, Rve., and *britannica*, Leach. I should suppress all three. If varieties are required, the most depressed form is *depressa*, Rve., and the most conoidal, *trochoidea*. This is from an examination of all Reeve's types.

ON THE 'SINUSIGERA APEX'.

Kesteven dealt with the history of the *Sinusigera* apex up to 1901 (Proc. Linn. Soc. N.S.W., 1901, vol. xxvi, pp. 533 seq.). After having shown that *tritoniformis*, Blain., should be classed as a *Purpura* as it had a *Sinusigera* apex very like that of *succincta*, Lam., and that the only two *Sinusigera* embryos previously followed to their adult stage had been shown to belong to *Purpura*, he wrote: "I do not expect the embryo of every *Purpura* to be of the *Sinusigera* type, but every embryo of the type to be that of a *Purpura*." Hedley, in 1903 (Mem. Aust. Mus., vol. iv, p. 383), endorsed this opinion by describing, as a new species of *Purpura*, a young shell with a beautifully sculptured *Sinusigera* apex dredged in deep water off New South Wales. Two years later he pointed out that this was the young of a *Coralliophila* (Rec. Aust. Mus., 1906, vol. vi, p. 219). In the same paper (p. 217) he records a new species of *Bittium* with a similar apex, writing: "The presence of a *Sinusigera* protoconch is of interest, but we have not sufficient data to now discuss its teleological significance." These destroyed Kesteven's conclusions, but I still consider the presence of a *Sinusigera* apex will aid in classifying shells into groups, if not genera. I would not class in the same group a shell with such an apex with a shell with a different apex, and would rewrite Kesteven's dictum thus: "I do expect the embryo of every *Purpura* (or any other sectional name) to be of the

Sinusigera type." To know whether a shell possesses a *Sinusigera* apex very young shells must be collected either alive or dead. Many shells possess such apices, but in adult specimens the characters are so obscure that it cannot be recognized. Moreover, it is very often tilted, and the latter whorls make the claw unrecognizable. A shell with a *Sinusigera* apex will be of widespread distribution, and, vice versa, many shells, widely distributed, will be found to owe their range to their *Sinusigera* youth.

The most common Purpuroid on Sunday Island was a beautiful little shell described by Suter as a sub-species of *Purpura striata* under the title *Bollonsi* (Trans. N. Zeal. Inst., 1905 (1906), vol. xxxviii, p. 331). Later he extended its range to New Zealand, but transferred it to *Drupa*, giving it specific rank (Proc. Malac. Soc., 1909, vol. viii, p. 254, pl. xi, figs. 5-7). He states in his description, "protoconch minute." Many shells were collected by me, young shells with the protoconch, as well as old ones showing variation of shape and form. Living on the wave-swept boulders they were very stumpy, the spire scarcely raised, and the mouth very heavily armoured. Constantly being knocked off and smashed, they all showed repairs, and it was noted that the new shell never had nodulous sculpture, the characteristic of the adult. Shells living in sheltered places had fine spires, being long and narrow, and the aperture not very strongly toothed. This series made the shell easily recognizable as that figured by Brazier from Lord Howe Island (Mem. Aust. Mus., 1889, vol. ii, p. 28, pl. iv, figs. 1-4, 7-12, 21, 22). The twelve figures there given are very good, though reversed. No description was offered. Brazier called it *Purpura Smithi*. Kesteven, in the paper first quoted, gave a description of this shell, but placed it as a variety of *Purpura tritoniformis*, Blain., with which, in my opinion, it has less affinity than with *Purpura striata*, Martyn, with which Suter first associated it. The shell is certainly a valid species, and is close to the latter species. I do not consider it a *Drupa*. The apical characters are: Five-whorled, *Sinusigera* in form, red-brown in colour, paler towards the apex, the last two whorls keeled at the periphery, with faint wrinkle sculpture longitudinally, only showing in fresh specimens. It is usually tilted.

Hedley has described the apex of *Purpura pseudamygdala* "of the *Sinusigera* type, broad, with rounded whorls, brown, smooth, and glossy" (Proc. Linn. Soc. N.S.W., 1903, vol. xxvii, p. 599). When Kesteven treated of the apices of *tritoniformis*, Blain., and *succincta*, Lam., he noted that *Purpura neglecta* was generically separable. Later he described its apex, showing it to consist of one and a half whorls indistinctly marked off (Proc. Linn. Soc. N.S.W., 1901, vol. xxvi, p. 714, pl. xxxvi, fig. 2), and included it in *Sistrum*. There was no doubt this was unsatisfactory, so Hedley (Proc. Linn. Soc. N.S.W., 1908, vol. xxxiii, p. 456) suggested it might be referred to *Kalydon* of Hutton. He overlooked the fact that *neglectum* is a very close ally of *scobina*, Q. & G., with similar apical characters, which is as unhappily placed in *Purpura*, but which is certainly not referable to *Kalydon*. I have seen no specimens of *Drupa* showing the apical

characters, but shall anticipate the existence of *Sinusigera* apices in that genus.

A rare Purpuroid on Sunday Island was a shell similar in general appearance to figures of *amygdala*, Kiener, and *pseudamygdala*, Hedley. It was immediately recognized by Mr. Hedley as *Drupa chaidea*, Duclos (Ann. Sci. Nat., 1834, p. 106, pl. i, fig. 4). Young in all stages were collected, and half-grown specimens agreed perfectly with Pease's figure of *Sistrum rugulosum* (Amer. Journ. Conch., 1869, vol. iv, p. 93, pl. xi, fig. 7), which Tryon had already referred to this species (Man. Conch., 1880, vol. ii, p. 187). Why this shell should be classed as a *Drupa* puzzled me, the only similar shell in that group being Blainville's *elatum*, which seemed also to me incorrectly placed. It was therefore pleasing to find Hedley, when he restored to the latter its Linnean designation *mancinella*, also transferred it to *Thais* (Proc. Linn. Soc. N.S.W., 1908, vol. xxxiii, p. 457). To that genus, using the name in its present broad sense, I would allot *chaidea*, Duclos. I find that this shell has a *Sinusigera* apex, five-whorled, shining white, smooth, and more genteel in form than *Smithi*, Braz. I do not doubt that such an apex will be found attached to *mancinella*, Linné.

I have noted that Hedley has described the apex of *Coralliophila Lischkeana*, Dunker, as *Sinusigera* in form. In that case the apex is very heavily sculptured, and it may be that such apices exist throughout the genus *Coralliophila*. I have seen apices in Sunday Island dredgings which agree perfectly with Hedley's description and figure (Mem. Aust. Mus., 1903, vol. iv, p. 382, fig. 96). I do not see any reason to doubt the existence of this beautiful *Coralliophila* in Sunday Island waters. An apex with an even more beautifully sculptured *Sinusigera* apex is followed by a half-whorl of sculpture which shows it to be either *Coralliophila nivea*, A. Ad., or a very close ally.

Quoy & Gaimard's *monodonta*, to which is united Sowerby's *madreporarum*, was referred by H. & A. Adams to *Coralliophila*. Pease, on account of its habits, placed it in *Rhizochilus*, but though it lives on coral, in exactly the same manner, I do not think it can be correctly there placed. I do not expect to find a *Sinusigera* apex attached to *Rhizochilus*. Tryon referred *monodonta* to *Galeropsis* (Man. Conch., 1880, vol. ii, p. 212, pl. lxvii, figs. 389-91, 398), and was followed by Hedley (Mem. Aust. Mus., 1899, vol. iii, p. 461). Melvill and Standen placed it in *Coralliophila* again (Journ. Conch., 1895, vol. viii, p. 110), and that place is probably correct. Young shells from dredgings show it to have a heavily sculptured *Sinusigera* apex.

So far, except the *Bittium*, all the *Sinusigera* apices have belonged to *Purpura*, *Drupa* (?), and *Coralliophila*. Searching through Sunday Island dredgings I came across a beautiful young shell showing a *Sinusigera* apex, which was clearly referable to *Alectrion*. It was only an odd shell, but as young shells which I had recognized as *gaudiosus*, Hinds, were at hand, I examined them, and found that they were undoubtedly also *Sinusigera* in form. Other odd young shells, specifically separable, but unidentifiable, had also similar

apices. In these the *Sinusigera* character is obscured, owing to the similarity in colour of the apex to the adult shell. One young one which was traced to *spiratus*, Adams, was, however, whitish, followed by a pink post-embryonic shell. I allude to these further in the succeeding notes. A shell which appears to be novel and referable to *Cantharus* has a *Sinusigera* apex, almost indistinguishable from that possessed by *Thais chaidea*, Duclos. From that character I conclude, if this shell is new, that it will not be long before it is again recorded, and perhaps from some far distant locality.

From these instances it will be seen that the *Sinusigera* is certainly represented in many genera, as widely understood at present. I should therefore state that no species should be allotted to a group of which the type has been shown to possess a *Sinusigera* apex, unless it also possess such an apex. And I would anticipate that all such groups will later be raised to the rank of genera. It is also possible in the latter case that differences in the *Sinusigera* will be useful in group-classifying. The discovery of the *Sinusigera* in the Alectrionidæ appears to me especially important, as such an aid may considerably reduce the work necessary in the revision of the species of that puzzling family. I have only seen one species of *Arcularia* possessing an apex, and though that was not perfect it was sufficient to decide it was not of the *Sinusigera* type. Deep-water species of *Alectrion*, from figures, do not seem to have *Sinusigera* apices.

ALECTRION GAUDIOSUS, Hinds.

Nassa gaudiosa, Hinds, Voy. Sulphur, 1844, p. 36, pl. ix, figs. 16, 17.
N. zonalis, A. Ad.: Suter, Trans. N. Zeal. Inst., 1905 (1906),
 vol. xxxviii, p. 331.

Under *gaudiosa*, Hinds, many names are grouped by Tryon, and amongst these is *zonalis*, A. Ad. The shells I collected on Sunday Island agree well with Hinds' type, and disagree with Adams' types. This species was rarely cast up on the beach, and young shells occurred in dredgings. From these the characters of the apex were obtained: four-whorled, rapidly increasing, shining, smooth, *Sinusigera* in form, the upper half dark brown, the lower half pale fawnish. This *Sinusigera* is more globular than those belonging to Purpuroid shells.

ALECTRION SPIRATUS, A. Adams.

Nassa spirata, A. Ad., Proc. Zool. Soc., 1851, p. 106.

A shell commoner than the preceding upon the beach agreed with shells from Lord Howe Island and also New South Wales. In the Australian Museum such shells were labelled *glans*, L., but with this determination I disagree. My specimens were found to coincide with the types of *spirata* from Swan River, West Australia. It is worth describing in detail: Protoconch *Sinusigera* in form, whitish, of four whorls, rapidly increasing, shining; this is usually missing from adult shells. The next two whorls are bright pink, each sculptured by about fourteen longitudinal ribs which are overridden by four spiral cords. In the next whorl these spirals fade away and vanish, and on the succeeding whorls the longitudinals follow their example, and

on the fifth adult whorl show only as nodules on the shoulder. The most extraordinary feature is the disappearance of the pink colour, which is replaced by creamy white, marked with longitudinal zigzag dashes of brown. As indicated above, the whorls are shouldered. The mouth is unarmoured. It is an easily recognizable shell by means of its pink tip and zigzag markings.

Another species, of which I have not the adult, has a *Sinusigera* more erect, and, though the post-embryonic sculpture is very similar, it is pure white. It is possible in this shell the sculpture may be retained on the later whorls. Another species, of which I possess no adults, has a shining, white, semi-globular *Sinusigera*, followed by a white shell, of which only the succeeding two whorls are faintly longitudinally ribbed, the third whorl showing no sculpture.

Alectrion spiratus, Adams, has been referred to *elegans*, Kien. (Coq. Viv., 1834, p. 56, pl. xxiv, fig. 97), but is easily separated from that shell, as known to me by figures, by the armoured mouth of the latter, as well as colour and sculpture.

SIPHONARIA DIEMENENSIS, Q. & G.

The first *Siphonaria* from the Kermadecs were recorded under the above name by Suter (Trans. N. Zeal. Inst., 1906 (1907), vol. xxxix, p. 295), with Hedley's concurrence. The numerous specimens I collected all varied, but were quite unlike typical *Diemenensis*, and Mr. Hedley, upon the quantity I showed him, would have preferred to attach them to *exulorum*, Hanley, a species described from Norfolk Island. To me they differed quite as much from that species. I do not intend to describe them, yet feel they are unsatisfactorily placed at present. A second species was found which I have referred to *atra*, Q. & G., upon Mr. Hedley's initiative. This is a much smaller shell than *atra* usually is, but does not disagree so decidedly as the former with its position. The perplexing feature of these shells is that beach specimens could not be made to coincide with either of the above two forms. A few live shells were found living on the big *Ancistromesus*, which seemed quite distinct, but I cannot think three species of *Siphonaria* can exist on such a small island. These shells varied in almost all the characters which have been used as differential features in the previous naming of *Siphonaria*, and the examination of figures of so-called species left me in despair.

GADINIA CONICA, Angas.

Gadinia conica, Angas, Proc. Zool. Soc., 1867, pp. 115, 220, pl. xiii, fig. 27.

G. pentagoniostoma, Sowb. : Angas, Proc. Zool. Soc., 1867, p. 220.

G. conica, Angas : Dall, Amer. Journ. Conch., 1871, vol. vi, p. 11.

G. Angasii, Dall, loc. cit.

Siphonaria albida, Angas, Proc. Zool. Soc., 1878, pp. 314, 869, pl. xviii, figs. 14, 15.

Gadinea nivea, Hutton, Journ. de Conch., 1878, vol. xxvi, p. 36 ;

Man. N. Zeal. Moll., 1880, pp. 37, 202 ; Trans. N. Zeal. Inst.,

1882 (1883), vol. xv, p. 144, figs. i-v.

On Sunday Island, Kermadec Group, I collected live as well as dead specimens of a *Gadinia*. Anyone who has met with a colony

of live *Gadinias* will have noted the extraordinary shapes they assume, as cramped for room they grow together. When unrestricted, low, flat, beautifully centred stars are found, then high conical and lop-sided forms, according to the space available. The Sunday Island specimens were compared with specimens of *nivea* from Lyttelton Harbour, and also in Otago, where the type was collected, and they were found to be inseparable. As Hutton had stated he was not satisfied that his species was distinct from *conica*, Angas, I took my specimens to Sydney with me. The common New South Wales species I collected both alive and dead, and found it quite indistinguishable from these shells. That species was known as *Angasii*, Dall, and in this identification Mr. Hedley agreed. The history of this name is quite interesting. In 1867 Angas described a species of *Gadinia* as *conica*, and also included in his Port Jackson List of Mollusca *pentagoniostoma*, Sowb., and quoted as reference to Sowerby's species *Conch. Ill.* But no such name appears in that work. Carpenter, in his "Mazatlan Shells", 1856, had referred a Mazatlan species to Sowerby's name, but could not find where Sowerby had used the name. Apparently it was only a manuscript name. Dall, on account of this prior use by Carpenter, gave the name *Angasii* to Angas's second species, pointing out that it might be only the adult form of *conica*, as the types of that species seemed small and immature. In 1878 Angas described from St. Vincent's Gulf, South Australia, a white *Siphonaria* as *albida*. Mr. Hedley pointed out that this might be a synonym.

I have examined the types of *conica*, also the shells from Port Jackson labelled *pentagoniostoma*, Sowb., by Angas, and consequently those upon which Dall founded his *Angasii*, also the type of *albida*, as well as other Australian and New Zealand specimens, together with my own from New South Wales, New Zealand, and the Kermadecs, and find that they must all be referred to one name, and that is *conica*, Ang.

PHILOBRYA COSTATA, Bern.

Philobrya costata, F. Bern., Bull. Nat. Mus., 1896; Journ. Conch., 1897, vol. xlv, p. 15, pl. i, fig. 5; p. 33, fig. 7.

P. Filholi, Bern., 1897, loc. cit., p. 16, fig. 1 (?); p. 13, pl. i, fig. 6.

That *Filholi*, Bern., is the young of *costata*, Bern., seems certain from the study of the figures quoted. Bernard's description upholds this view, as he gives *exactly* all the same measurements for his two species, which is palpably inconsistent with the diagnoses of the species. As the figures show *Filholi* to be a smaller shell than *costata*, and he states "toutes les figures sont grossies 12 fois", I conclude the measurements are incorrect.

My Kermadec shells were mostly valves, only a few complete young shells being found. Some agreed perfectly with Bernard's figure of *Filholi*, though others varied slightly from the figures. Some beautiful pink valves were noted. Hedley (Proc. Linn. Soc. N.S.W., 1906, vol. xxx, p. 544, pl. xxxii, figs. 14, 15) has given figures of the young and adult of his *parallelogramma*, which seem quite comparable with Bernard's figures of his *Filholi* and *costata*.